CHAPTER 5

WATER POLLUTION CONTROL PROGRAMS

WATER POLLUTION CONTROL PROGRAMS

Point Source Control Program

Wastewater Treatment Facility Permitting

Point source pollution refers to any discharge from municipal or industrial facilities that can be identified as emanating from a discrete source such as a conduit or ditch. Kentucky has more than 10,000 active individual or general permits covered by the Kentucky Pollutant Discharge Elimination System (KPDES) program. Of the 2,332 individual permits, 244 are municipal, 969 are industrial, and 1,119 are commercial or private. More than 4,800 coal mining-related discharges are covered under the KPDES Coal General Permit. Starting with the October 1992 EPA deadline for certain existing industrial stormwater sources, Kentucky has covered more than 2,600 facilities under eight general permits. EPA deadlines also required stormwater permit applications from two Kentucky metropolitan areas (Louisville and Lexington). The permits issued by the state for these areas mandate comprehensive pollution prevention planning programs augmented by system-wide stormwater monitoring.

The overflow from combined sanitary and stormwater sewers in excess of the interceptor sewer or regulatory capacity that is discharged into a receiving water without going to a publicly owned treatment works (POTW) is considered a combined sewer overflow (CSO). There are currently 354 CSO points statewide from 16 facilities. Most of these are located on the Ohio River and its immediate tributaries. The state began to include permit language addressing CSOs in the summer of 1991 as permits expired and were reissued. Currently, all of the facilities have permits reissued with CSO language included.

Section 104(b)(3) grants have been awarded to the Kentucky Division of Water (DOW) for CSO studies by the Metropolitan Sewer District in Louisville - Jefferson County and by the University of Kentucky's Water Resources Research Institute in the Northern Kentucky area. Water quality data specifically related to CSO events were being collected to determine the role of CSOs in water quality problems in the study area. Both grants have been completed and reports written. This information was used in developing a statewide database for tracking CSO trends and should facilitate future permitting and implementation strategies.

Wastewater permit limits in Kentucky have been water quality based since National Pollutant Discharge Elimination System (NPDES) program delegation on September 30, 1983. Generally, there are two approaches for establishing water quality-based limits for toxic pollutants: (1) chemical-specific limits, which are based on individual

chemical criteria for all known toxic or suspected toxic pollutants in an effluent; and (2) whole effluent toxicity (WET) testing, which sets limits on an effluent's total toxicity as measured by acute or chronic bioassays on appropriate aquatic organisms. Both approaches have advantages and drawbacks, but when both are integrated into a toxics control strategy, they provide a flexible and effective control for the discharge of toxic pollutants.

Effluent Toxicity Testing

Toxicity data are available for only a limited number of compounds. Single parameter criteria often do not adequately protect aquatic life if the toxicity of the components in the effluent is unknown, there are synergistic (greater than predicted) or antagonistic (less than predicted) effects between toxic substances in complex effluents, or a complete chemical characterization of the effluent has not been carried out. Since it is not economically feasible to conduct exhaustive chemical analysis or determine the toxicity of each potentially toxic substance, the most direct and cost-effective approach to measuring the toxicity of complex effluents is to conduct whole effluent toxicity tests with aquatic organisms.

The DOW adopted an integrated strategy in 1988 to control toxic discharges into surface waters that included both chemical-specific limits and WET limits on certain KPDES permits. These limits were applied to most major and selected minor discharges with an approved pretreatment program. The WET limitations were developed for both acute and chronic levels based on a case-by-case evaluation of the discharge type and volume and the size of the receiving stream. WET is a useful complement to chemical-specific limits because it directly measures toxicity to aquatic organisms. It takes into account the aggregate toxicity in complex effluents and the chemical and physical interactions occurring in the effluent.

The DOW has implemented the WET limit into KPDES permits as a toxicity unit (TU). The TU allows acute and chronic toxicity to be reported numerically in the permit and on a discharge monitoring report (DMR) in order to determine compliance. Toxicity tests are conducted on a monthly basis for the first year of biomonitoring and quarterly in subsequent years. Test species are water fleas *(Ceriodaphnia dubia)* and fathead minnow *(Pimephales promelas)*. Acute tests are 48-hour static exposures. Chronic tests are the 7-day *P. promelas* growth test and the 7-day *C. dubia* reproduction test. Non-compliance with the acute toxicity limit is demonstrated if the LC50 (that concentration which causes 50 percent mortality in the test organisms) is less than the permit limit concentration. Non-compliance with the chronic limit is demonstrated if the IC25 (that concentration which causes a 25-percent reduction in growth or reproduction) is less than the permit concentration. Prior to 1993, compliance with a chronic limit had been based on a no-observable-effect level (NOEL).

During 1994 and 1995, toxicity

Table 5-1
Division of Water Effluent Toxicity Testing
1994-1995

FACILITY	TOXIC SITES	TOTAL SITES	PERCENT TOXIC
	1994		
MUNICIPAL:			
MAJOR[a]	1	2	50
MINOR WITH PRETREATMENT[b]	0	0	0
TOTAL	1	2	50
INDUSTRIAL	6	21	29
	1995		
MUNICIPAL:			
MAJOR	4	11	36
MINOR/PRETREATMENT	0	3	0
TOTAL	4	14	29
INDUSTRIAL	0	2	0

[a]At least one million gallons a day
[b]Less than one million gallons a day and with a pretreatment program

tests were performed by the DOW at 16 municipal and 23 industrial facilities. Results of these tests indicated acute toxicity at 6 locations (21 percent) and chronic toxicity at 5 (45 percent) (Table 5-1). These effluent tests indicated potential impacts to portions of receiving streams in six river basins.

The DOW has placed toxicity limits on 81 municipal and 43 industrial treatment facilities. Figure 5-1 and Table 5-2 show a breakdown of these 124 permits by facility type and toxicity limit.

During 1994 and 1995, a total of 2,073 tests were conducted by these facilities in accordance with KPDES biomonitoring permit requirements. The results showed 104 facilities (84 percent) met their toxicity limit (Table 5-2). Those not in compliance are conducting a toxicity reduction evaluation (TRE). The TRE is a step-wise process in which the operation of the facility is first evaluated and optimized. The effluent is then fractionated, if necessary, to determine what constituents are contributing to the toxicity, and efforts are made to eliminate these agents through source reduction or treatment optimization. Figure 5-2 shows the percentage of facilities in compliance since 1988. The percent compliance had remained relatively constant, ranging from 68 to 78 percent since the program started in 1988 until 1993. A steady increase in the percentage of facilities in compliance can be seen in this two-year reporting period. As the number of KPDES permits with biomonitoring has increased over the years, the number of resolved TREs had also increased up to 1993 (Figure 5-3). In the 1994-1995 reporting period, as fewer facilities entered into a TRE, the number of TREs being completed dropped.

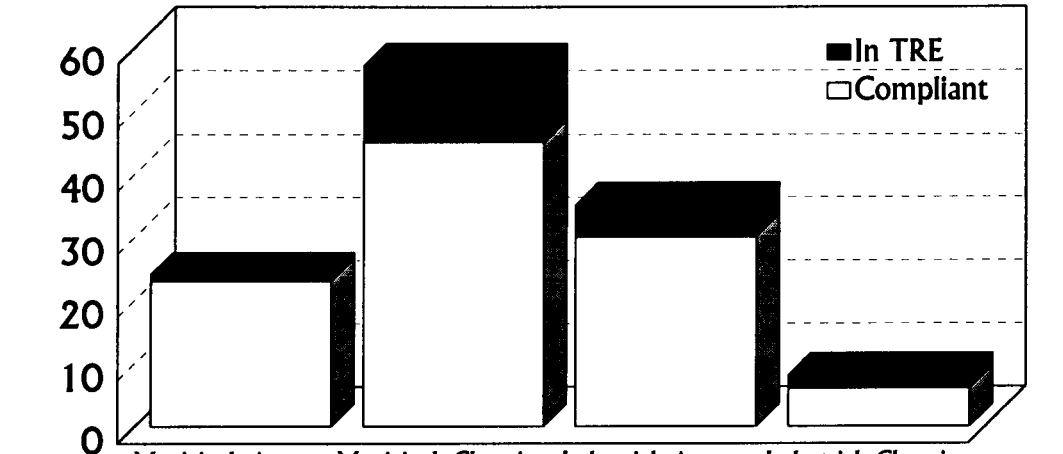
Table 5-2. Summary of Biomonitoring Permitted Facilities at the End of 1995

	FACILITIES	TREs	PERCENT COMPLIANCE
INDUSTRIAL			
ACUTE	35	5	85.7
CHRONIC	8	2	75.0
MUNICIPAL			
ACUTE	24	1	95.8
CHRONIC	57	12	78.9
TOTAL	124	20	83.9

Thirteen facilities had completed TREs by the end of 1994, and 12 were finished by the end of 1995. Twenty facilities (of a total of 124 with toxicity limits) are currently conducting TREs. The time needed to complete a TRE has ranged from eight months to four years and seven months. There are currently five facilities that have been in a TRE for more than five years. These facilities have not been able to determine a cause of their chronic toxicity.

Figure 5-3 shows the progression of successfully completed TREs since 1990. The reduction of toxic discharges is being achieved through new treatment plant construction, plant improvements, plant operational changes, identification of new treatment options, removal of toxic sources, and enforcement of pretreatment program requirements.

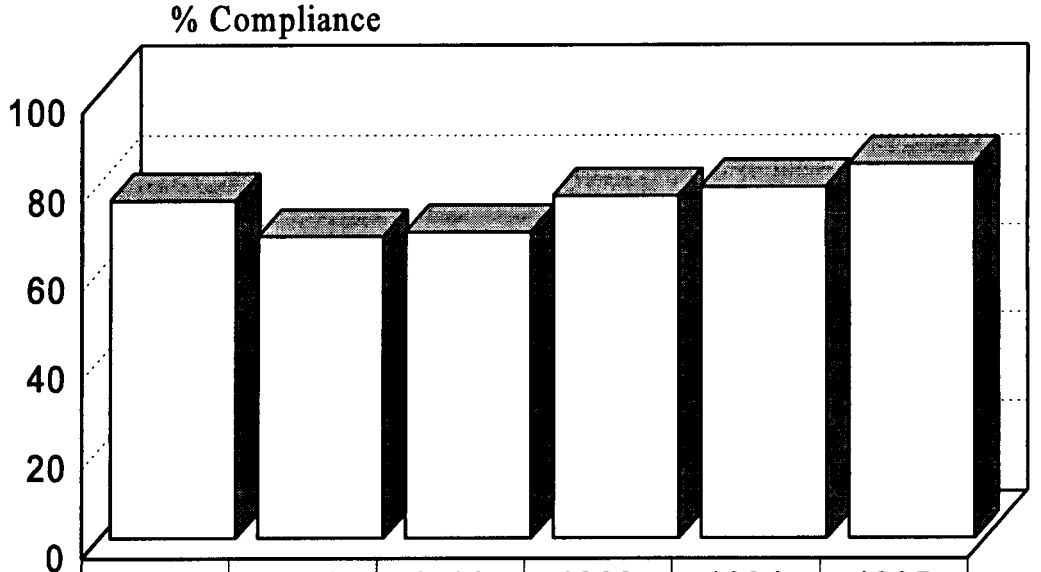
Figure 5-1. Number of Biomonitoring Permits By Facility and Type



	Municipal, Acute	Municipal, Chronic	Industrial, Acute	Industrial, Chronic
In TRE	1	12	5	2
Compliant	23	45	30	6

Year-end 1995

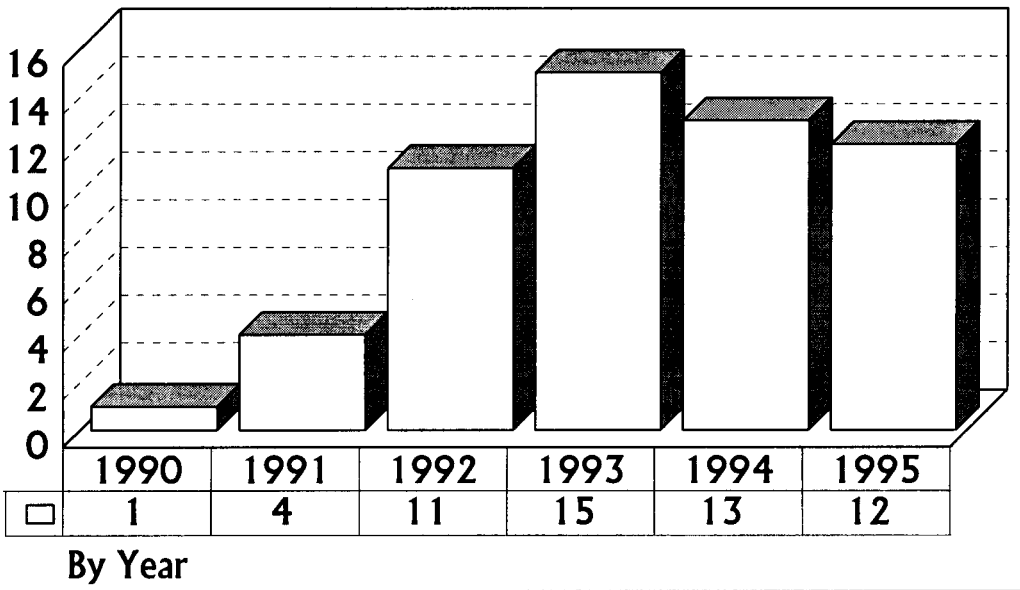
Figure 5-2. Biomonitoring Compliance



	1990	1991	1992	1993	1994	1995
□	76	68	69	77	79	84

*Percent Compliance is defined as facilities not in TRE

Figure 5-3. Number of TRE's Completed



Pretreatment Program

The quality of Kentucky's surface waters continues to face a threat from improperly treated industrial waste discharged into municipal sewage treatment systems. Such waste often contains pollutants that are either not removed by the municipal treatment process or, if removed, result in the generation of contaminated sludge. In an effort to control this problem, Kentucky has approved pretreatment programs in 71 cities (64 active, 7 inactive as of December 1995) and has screened several others to determine their need for a pretreatment program. New programs are being developed by Carrollton, Hickman, Irvine, and Morehead. Program submission and approval is expected in 1996. A list of communities with approved pretreatment programs and the estimated costs to administer the local program are presented in Table 5-3. The facilities that need programs are all on schedule for obtaining approval. Once approved, each program is inspected annually and must submit semi-annual status reports to the DOW for review. These reports are incorporated into a computer data base known as the Permit Compliance System (PCS) and Pretreatment Permits and Enforcement Tracking System (PPETS). Kentucky was recognized by U.S. EPA in 1991 and 1992 for achievements in its use of the PPETS program. Kentucky assesses pretreatment program effectiveness by reviewing wastewater sludge quality for five heavy metals: cadmium, copper, lead, nickel, and zinc. Sludge quality has shown continuous improvement in the 1994-95 period.

Table 5-3
Total Estimated Level of Annual Funding
Required to Implement the
POTW Pretreatment Program

No.	POTW	$/Year
1	Adairville	INACTIVE
2	Ashland	88,847
3	Auburn	15,000
4	Bardstown	25,000
5	Beaver Dam	2,000
6	Berea	7,000
7	Bowling Green	100,0000
8	Cadiz	INACTIVE
9	Calhoun	N/A
10	Calvert City	5,000
11	Campbellsville	79,550
12	Campbell/Kenton SD #1	125,000
13	Caveland Sanitation	2,000
14	Corbin	50,146
15	Cynthiana	25,000
16	Danville	25,000
17	Edmonton	INACTIVE
18	Elizabethtown	159,280
19	Elkton	10,000
20	Eminence	13,500
21	Flemingsburg	6,000
22	Frankfort	110,000
23	Franklin	25,000

Table 5-3 (Continued)

No.	POTW	$/Year
24	Fulton	N/A
25	Georgetown	12,000
26	Glasgow	N/A
27	Guthrie	8,000
28	Harrodsburg	12,500
29	Hartford	5,000
30	Henderson	37,500
31	Hopkinsville	24,358
32	Jamestown	11,500
33	Lancaster	INACTIVE
34	Lawrenceburg	13,450
35	Lebanon	12,000
36	Leitchfield	15,050
37	Lexington	148,000
38	Livermore	N/A
39	London	N/A
40	Louisville	1,761,400
41	Madisonville	25,000
42	Marion	INACTIVE
43	Mayfield	8,500
44	Maysville	14,000
45	Middlesboro	15,000
46	Monticello	10,000

Table 5-3 (Cont.)

No.	POTW	$/Year
47	Morganfield	N/A
48	Morgantown	30,000
49	Mt. Sterling	13,000
50	Murray	N/A
51	Nicholasville	10,000
52	Owensboro	75,000
53	Owingsville	N/A
54	Paducah	78,000
55	Paris	10,000
56	Princeton	20,000
57	Richmond	18,000
58	Russellville	14,900
59	Scottsville	INACTIVE
60	Shelbyville	19,500
61	Shepherdsville	N/A
62	Somerset	125,000
63	South Campbell County	-[a]
64	Springfield	11,000
65	Stanford	2,000
66	Tompkinsville	INACTIVE
67	Versailles	3,000
68	Williamsburg	15,000
69	Williamstown	3,760
70	Winchester	30,000
71	Wurtland	20,000
	TOTAL	$3,504,741

[a] Operated by and costs included with Campbell/Kenton SD #1

Table 5-4. Wastewater Treatment Facilities That Came on Line During Federal Fiscal Years 1994-1995 (October 1, 1993 - September 30, 1995)

Facility	Date on Line	Cost
Loan		
Brandenburg	10/01/93	1,802,290
Georgetown	10/28/93	6,119,705
Greenup	10/29/93	450,000
Williamsburg	11/15/93	1,042,411
Melbourne	12/10/93	773,156
Middlesboro	12/16/93	178,085
London	12/17/93	6,305,754
Hickman	01/07/94	1,779,494
Wheelwright	03/15/94	361,675
Providence	04/08/94	820,069
Murray	04/19/94	5,161,272
Olive Hill	05/25/94	2,467,915
Stanford	06/03/94	685,295
Franklin	06/29/94	497,979
Flemingsburg	11/21/94	1,142,183
Morehead	01/13/95	3,347,424
Corinth	02/24/95	200,766
Eminence	03/25/95	1,375,000
Martin	04/15/95	579,212
Pineville	05/11/95	2,314,150
Total		**37,403,835**
Grant		
Louisville MSD	09/26/94	10,256,677
Martin	04/15/95	868,840
Caveland Sanitation Authority	04/19/95	5,018,949
Total for EPA Funded Projects		**16,144,466**

During 1994, a cooperative arrangement was strengthened between the DOW and the state's Economic Development Cabinet to coordinate industrial recruiting and siting as affected by pretreatment considerations.

In the fall of 1995, DOW pretreatment staff, with the assistance of the programs in Louisville and Owensboro, conducted two pretreatment program implementation workshops for more than 180 municipal, industrial, and consultant personnel.

The National Pretreatment Excellence Awards recognize those publicly owned wastewater treatment plants that have developed and implemented effective and innovative pretreatment programs. EPA's award program was divided into four categories based on flow of the POTW: 0 to 2.0 MGD, 2.01 to 5.0 MGD, 5.01 to 20.0 MGD, and greater than 20 MGD. These categories have been changed to ones based on the number of significant industrial users (SIUs) served: 1-10, 11-20, 21-50, and greater than 50.

With the beginning of the awards program in 1989, Kentucky POTWs have fared well, with a total of five programs that have received the awards:

Year	POTW	Category
1989	Louisville MSD	(20 + MGD)
1990	Bardstown	(0 - 2.0 MGD)
	Richmond	(2.01 - 5.0 MGD)
1991	Leitchfield	(0 - 2.0 MGD)
	Corbin	(2.01 - 5.0 MGD)

Table 5-5
Investment Needs for Wastewater Treatment Facilities in KY 1994-2014
(In millions of January 1994 dollars)

Facility	Projected Needs 2014 Population
Secondary treatment	$566
Advanced secondary treatment	$102
Infiltration/Inflow	$124
Major rehabilitation of sewers	$149
New collector sewers	$618
New interceptor sewers	$532
Correction of combined sewer overflows	$1170
Total	$3,261

Municipal Facilities

Construction grants, state revolving loan fund monies, and other funding programs have provided more than $53 million for the construction of 23 wastewater projects that came on line during FFY 94-95 (Table 5-4). More than $850 million have been awarded since 1972; $281.5 million in the past ten years and $90.3 million in the last two years. The 1994 needs survey, conducted by the DOW as part of its facilities planning process, indicated that some municipal discharges continue to impair water quality and pose potential human health problems.

Table 5-6 NEEDS BY ADD	
ADD	**NEED**
Barren River	$66,462,877
Big Sandy	$131,088,000
Bluegrass	$311,299,000
Buffalo Trace	$19,317,000
Cumberland Valley	$139,202,766
FIVCO	$56,543,258
Gateway	$34,415,500
Green River	$179,723,500
Kentucky River	$61,523,950
KIPDA	$509,503,800
Lake Cumberland	$71,085,844
Lincoln Trail	$104,490,475
Northern Kentucky	$233,518,000
Pennyrile	$114,753,000
Purchase	$57,638,000
CSO Projection	$1,170,593,000
TOTAL	**$3,261,157,970**

State and federal minimum treatment requirements are not being met in some instances. The 1994 Needs Survey identified a capital investment need of $3.26 billion through the year 2014 to construct and rehabilitate wastewater treatment facilities and components for Kentucky, based on the 1990 population. A detailed breakdown of investment needs is presented in Table 5-5.

To determine the 1994 CSO needs, an inflation factor was derived from the engineering news record construction cost indices. The projected 1994 CSO needs are $1,170,593,000. Regional needs can be shown by area development district (ADD). The total needs for each ADD are listed in Table 5-6. Because of the lack of documentation in some areas, the reported CSO needs have been omitted from each ADD in Table 5-6 and included at the bottom of the list to give a more unbiased comparison.

Kentucky has operated the state revolving loan fund (SRF) for seven years. Seventy-six projects totaling $190.2 million have been funded by SRF money through September 1995. Project costs have averaged more than $2 million and have ranged from $83,000 to $15,553,000.

The SRF has proved to be a popular funding program for publicly owned wastewater treatment facilities. With interest rates ranging from 0.4 to 4.3 percent, the SRF is used for funding complete projects as well as to supplement grant-funded projects.

The funding formula for allocation of capitalization grants for SRF loans provides 1.2872 percent of the authorized amount for Kentucky. This figure falls short of Kentucky's fair share, whether compared on a needs or a population basis. A funding allotment percentage for Kentucky of approximately 1.55 percent would be more in line with needs and population figures. The estimated annual difference in available state revolving fund money would translate into two or three additional wastewater projects for Kentucky communities. A

change in the allotment is being considered by Congress.

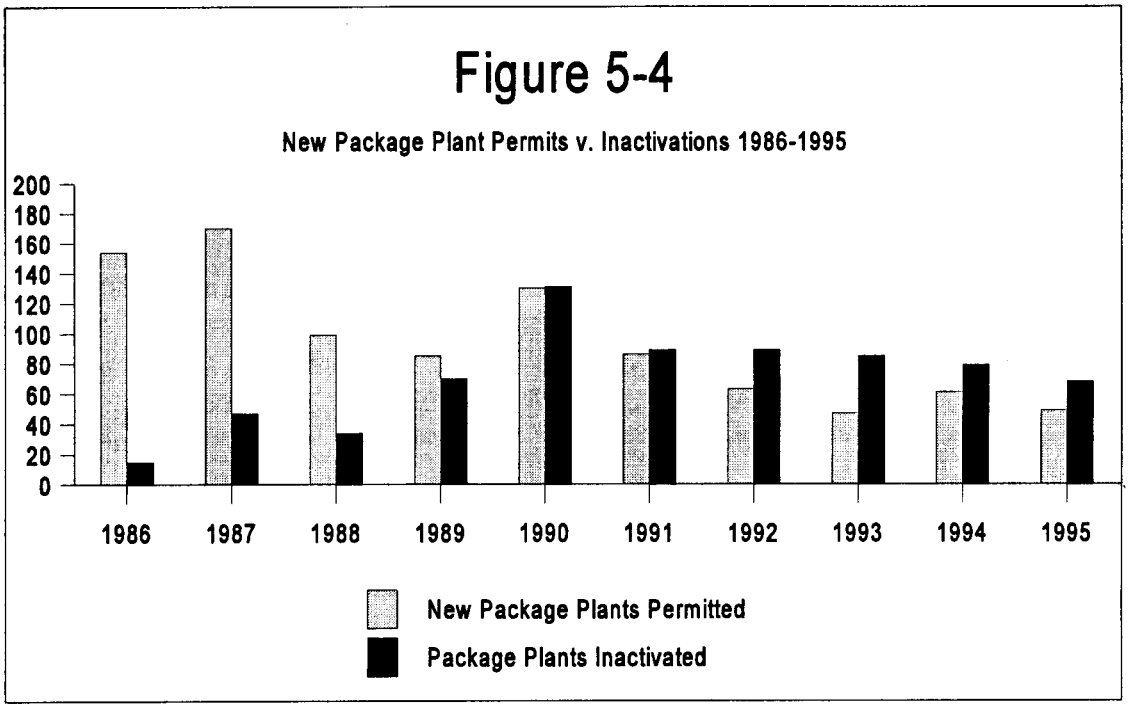
Wastewater Regionalization

The DOW has directed major efforts toward promoting wastewater regionalization with the goal of eliminating small "package" wastewater treatment plants. These plants, which compose a majority of the state's 1,580 non-municipal wastewater treatment facilities, tend not to be properly maintained and thus are less effective and less efficient than larger plants. Data compiled by the DOW on the performance of 757 private facilities and 58 small municipal plants in the 38 counties from April 1989 through March 1990 indicated that performance of these facilities was not good. Regional wastewater treatment facilities eliminate discharges from many of these existing small plants by diverting the flow to a larger facility or by combining two or more existing facilities into a new or selected regional treatment facility. Regional facilities also prevent new discharges by requiring connection to an existing facility or creating sanitation districts and regional wastewater authorities.

Progress in the regionalization effort is evident over the past several years. Beginning in 1990, more discharge permits have been inactivated than new ones added (Figure 5-4). Thirty-one package plants in the Northern Kentucky area (Boone, Campbell, and Kenton counties) and 40 package plants in the Louisville/Jefferson County area were eliminated in the two-year reporting period. Reductions in the number of package plants will continue to be realized because of projects in the planning or construction phase in several counties. Contracts with three area developments districts, one regional health organization, and the Council of State Governments have provided information for the development of regionalization strategies at the state and local level. These agencies have provided technical assistance to many plants to enhance water quality.

Kentucky's 15 area development districts (ADDs) are regional planning agencies empowered to engage in the work of program development through administrative, research, and planning efforts in their constituent counties in order to encourage the development of public and private property in the most appropriate relationships. Among their many duties, the ADDs may advise municipalities and special districts seeking technical and financial support for wastewater treatment projects (e.g., selecting engineering services, applying for federal grant/loan funding). Most ADDs also provide management assistance (e.g., budgeting, personnel policies) to wastewater utilities. Some ADDs provide wastewater facilities with assistance in day-to-day utility operation and maintenance. The DOW facilitates regional planning via the Section 604(b) water quality management planning program.

The **Gateway District Health Department (GDHD)** has contracted with the DOW for wastewater regionalization activities in eastern



Kentucky since 1990. The GDHD promotes public awareness of wastewater treatment issues, trains package plant operators, and publicizes the regionalization concept. Most notably, the GDHD completed an innovative and successful water/wastewater education project for students at Ezel Elementary School in the fall of 1992. The GDHD is now bringing the Ezel program to other schools in the Gateway Region. GDHD has also conducted rural wastewater disposal system surveys in the Gateway counties in an effort to identify areas where small-scale methods of sewage disposal are not working, assisted land owners in taking appropriate corrective action, and assessed people's knowledge of wastewater systems in order to develop effective educational programs. Gateway officials have been instrumental in securing public support in several unsewered communities for sewer line extensions to regional facilities. Since entering the Section 205(j)/604(b) program, the GDHD's efforts have already eliminated three package plants, and another five will be eliminated upon completion of the current projects described above. Through the GDHD's work, first-time sewer service will have been extended to nearly five percent of the total households in the Gateway region by 1995.

The **Kentucky River Area Development District (KRADD)** in southeastern Kentucky entered the Section 205(j)/604(b) program in FFY 1993 to address sewage problems in the North Fork in the Kentucky River. The purpose of the project is to improve the water quality within the district, with emphasis on regionalization of wastewater treatment and use of nonpoint source pollution alternatives to ensure proper disposal of sewage. The DOW has issued a swimming advisory for all or

part of the North Fork for the past four summers, citing excessive levels of fecal coliform bacteria, indicating a pervasive problem still exists. Due to this, KRADD continues to have the North Fork Task Force meet regularly to work with the KRADD project coordinator to develop and implement project activities. KRADD convenes the Regional Water Quality Committee, composed of local citizens and elected officials, to discuss the status of the task force's efforts and assist in planning and directing those efforts. KRADD also continues to work with the DOW, the Kentucky River District Health Department, local officials, and citizens to identify clusters of houses with straight pipe discharges of raw sewage and map the information using GIS technology. This was done on a watershed basis from February to May 1993. KRADD checks with all KPDES wastewater permittees to make sure of compliance, offer assistance to those who are still in compliance, and provides assistance to any proposed new systems. Finally, KRADD is assisting local health departments in the development and implementation of a program of public outreach and education to develop an awareness of wastewater treatment problems and nonpoint source pollution issues.

The **Purchase Area Development District (PADD)** in western Kentucky has participated in the Section 205(j)/604(b) program since FFY 1990. The PADD's not-for-profit Purchase Public Service Corporation (PPSC) provides technical assistance to several wastewater facilities in the ADD. The PPSC also contracts to provide routine operation and maintenance services and has even assumed ownership of plants. The PPSC performs necessary repairs or modifications to such forfeited systems and seeks to incorporate them into more comprehensive systems. For example, throughout 1995, PPSC addressed issues surrounding the Blandville West Estates wastewater facility. Technical assistance of the PPSC staff included forwarding a collection system evaluation to the DOW. Modifications included repairing and replacing manhole covers and installation of an aerobic digester at the facility that will increase plant efficiency and reduce sludge hauling costs. Finally, they concluded that due to the facility's proximity to Paducah's main and the McCracken County Sewer District No. 2 collection system, the most efficient alternative was to consolidate with one of those entities. The PPSC also dealt with the Holifield Heights Subdivision facility in 1995 and, after reviewing options, completed a protective structure for the Great Oaks Subdivision system blower/motor units, which should ensure proper long-term operation of the facility. Finally, financial records have been maintained for all systems owned by the PPSC. This information will permit rate increases to be filed in order to make each system self-sufficient.

Madison County entered into a Memorandum of Agreement (MOA) with the DOW in December 1994 to study the feasibility of a regionalized sanitary sewer district for a portion of northern Madison County. The Madison County Fiscal Court (MCFC) expects pressure for development in the northern portion of the county since this part of Interstate

75 is among that proposed for widening to six lanes. Local officials work to anticipate and plan for the impending growth and future economic viability of the area, while protecting its quality of life and natural resources. To plan for this growth and protect the health of the citizens of the county, the MCFC desires to develop a plan to provide sanitary sewer service to the described area that the city of Richmond cannot serve. The feasibility study will determine the economic and engineering feasibility of regionalized sanitary sewer service for the study area to eliminate the existing point source discharges to small streams and the potential degradation of ground water resources by subsurface disposal methods. This study is currently in process and should be finalized by the summer of 1996.

Section 104(b)(3) Water Quality Improvement Grants

The Kentucky DOW determined in its 1992 Section 305(b) report that because of water quality problems, Herrington Lake does not support its designated aquatic life use, and the 1992 Section 303(d) report identified the lake as a high priority water body requiring a Total Maximum Daily Load (TMDL) study. Due to these findings, a study to determine existing phosphorus loadings, to identify the principal sources of this investigate pollutant, and to estimate the reductions needed to lower the trophic status of the lake began in July 1994. The study is being funded under the FFY 1994 Clean Water Act Section 104(b) (3) Special Studies Program. The DOW contracted the data collection and analysis components of this project to qualified staff in the U.S. Geological Survey (USGS), and the data collection program is being conducted over a two-year time frame with 16 sampling dates each year. As the official grant recipient of this project, the DOW provides staff oversight and management assistance to the contractor to fulfill the obligations of the work plan. A final report, scheduled for September 1997, will describe the existing problems in Herrington Lake and provide a detailed analysis of the sources of these problems. The report will be used in making permit decisions for point source discharges and will serve as a reference for all agencies and citizen groups involved with reducing nonpoint sources of pollution.

Chenoweth Run, a tributary of Floyds Fork in Jefferson County, is an urban stream affected by both point source discharges and urban runoff from the most likely sources of the Jeffersontown Wastewater Treatment Plant and the Bluegrass Industrial Park. Two citizen groups repeatedly expressed concern over the poor water quality in the stream causing the DOW to begin a study in August 1994. The study, funded under the FFY 1994 TMDL mini-grant, is to determine the most significant source or sources of pollutants affecting Chenoweth Run and propose solutions. The DOW began by conducting quarterly meetings with other interested agencies and citizen groups to solicit comments and contracting with the U.S. Geological Survey to conduct the data collection program. The report generated from this study will serve as a reference for all agencies and citizen groups involved with

this stream and will also be used by the DOW when making regulatory decisions regarding point and nonpoint source controls.

In the spring of 1991, the DOW began a detailed investigation into the wastewater treatment plant (WWTP) at Bardstown in Nelson County. This facility employs two large, deep surface-aerated lagoons at the head of the plant, where all raw sludge entering the system settles. Since the plant's existence, the lagoons have experienced no significant growth in sludge depth, and Bardstown has not had to dispose of any sludge. A DOW investigation completed in 1992 confirmed that the city was experiencing surprising results with its innovative treatment system. The DOW then proposed, with the use of Section 104(b)(3) funding, to further evaluate the Bardstown model and determine its applicability to other settings in Kentucky. Phase I of this project was the analysis of the Bardstown system. The DOW then contracted with the Water Resource Research Institute to analyze the results of the DOW investigation. A two-part report containing the Kentucky Sludge Survey and the pathogen reduction analysis was completed and delivered to the DOW and EPA. The WRRI is now beginning an investigation of groundwater quality in the areas surrounding the lagoons. This work should be completed by September 1997.

In 1991, the DOW received funding to conduct a water quality study of combined sewer overflows (CSO) in the northern Kentucky region. The original objective of this project was to develop a database framework for use in assessment and management of CSOs in Kentucky, with a secondary objective of an assessment of the impact of CSOs on the water quality of the northern Kentucky region. Both components of the study are being conducted through the Kentucky Water Resources Research Institute (WRRI) and funded through the 104(b)(3) grant program. It is expected that the results of the water quality assessment study will provide valuable information for use by the DOW in the preparation of CSO permits for the northern Kentucky region. The CSO assessment component began in February 1993 with extensive sampling conducted on Banklick Creek in Kenton County. The CSO database component of the project began in September 1993. During 1994, the CSO assessment was extended to the Licking River in order to augment the results of the Banklick study with some additional samples. Also, the CSO database study involved the assembly and construction of the proposed database framework. After consultation with the DOW, final adjustments are being made to the database. Final reports have been received for both the Banklick Creek and Licking River assessments.

Under the FFY 95 Section 104(b)(3) Water Quality Improvement program, $200,000 in federal funding was awarded to purchase a workstation for the construction and management of a project-specific geographic information system, test the watershed approach on an impaired river segment, and assess the needs of the agency's information systems required to implement the

watershed approach. The DOW has purchased the necessary hardware and software to begin development of a geographic information system and has hired a consultant to serve in the DOW offices as a full-time GIS technician. Work is under way to construct the base map for the project area. Given the organizational development of the Kentucky River Authority, the DOW has elected to focus its FFY 95 funding on conducting a watershed study of the North Fork of the Kentucky River, with the Institute to conduct the study. The agency's data assessment is under way with a comprehensive work flow analysis planned for 1996 to determine the information system requirements for the DOW's transition to the watershed approach. For FFY 96, the DOW proposes to further develop the approach through the convening of an in-house task force to oversee framework development, stakeholder facilitation, and staff training. Global positioning systems (GPS) will be used to verify point source outfall locations within the study area. This information will be built into the project's GIS. Finally, the DOW will utilize FFY 96 funding to expand its environmental education efforts in areas within the Kentucky River basin.

Boat Sewage Disposal

Boats are not allowed to discharge sanitary wastewaters into most of Kentucky's lakes. Where such discharges are allowed, the potential exists for local water quality problems in areas of concentrated houseboat activity. The DOW, Division of Water Patrol, Department of Parks, and Department of Fish and Wildlife Resources entered into an MOU in 1993 to address the problem of boat sewage disposal. Funding was obtained through the Clean Vessel Act to provide public education and pumpout facilities at several marinas. The Department of Fish and Wildlife Resources has acted as the lead agency. The first four projects, at Jenny Wiley, Rough River, Buckhorn Lake, and Dale Hollow state parks, were directed at state-operated marinas. Total funding for these four projects was $85,500, with 75 percent as CVA money and 25 percent as state in-kind matching funds. The second round of CVA funding was obtained in 1995. Funds were directed at the following six marinas operated by private vendors:

- Moutardier Resort and Marina - Nolin Lake
- State Dock - Lake Cumberland Resort Park
- KY Dam Village State Resort Park Marina - Kentucky Lake
- Kuttawa Harbor Marina - Lake Barkley
- Limestone Bay Yacht Club - Ohio R. At Louisville
- Big Bear Resort - Kentucky Lake

Funds for these six projects totaled $109,815, again with a 75/25 percent federal/state split. All projects except at Kentucky Dam Village have been completed.

Section 401 Water Quality Certification

Statutory authority over water quality certification is contained in KRS

224.16-50. All existing uses of surface waters, including those of wetlands, are protected under Kentucky Water Quality Standards (401 KAR 5:026;029;030;031) even if the waters and their designated uses are not specifically listed in regulation. "Existing use" is defined as attainment of legitimate uses in or on a surface water of the Commonwealth on or after November 28, 1975 (401 KAR 5:029, Section (1)(p)). The state may issue, waive, or deny water quality certification for any federally permitted or licensed activity that may result in a discharge into one acre or more of wetlands or 200 linear feet of blue-line stream as designated on a U.S.G.S. 7.5 minute (1:24,000) topographic map. The state is to certify that the materials to be discharged into surface waters of the Commonwealth will comply with the applicable effluent limitations, water quality standards, and any other applicable conditions of state law. Discharges may include, but are not limited to, dredged spoil, solid waste, garbage, rock, and soil. The DOW (1993) also has issued guidelines to mitigate unavoidable impacts to streams.

The state certification process is typically triggered through an individual Section 404 permit application and the associated COE Public Notice. Water quality certifications are also required for COE nationwide permits as listed in Table 5-7. Nationwide permits include discharge activities that are substantially similar in nature and have been determined by the COE to cause minimal adverse impacts to waters of the U.S. Water quality certifications of nationwide permits protect water quality and aquatic life from a wide array of discharge activities within waters of the Commonwealth.

Table 5-8 summarizes 401 certification activities for this 305(b) reporting period. While the program has become increasingly effective in protecting waters of the Commonwealth from activities not typically regulated by point source programs, there is a lack of sufficient resources for compliance assurance and enforcement programs. The COE and DOW need to significantly increase surveillance and enforcement activities in order to ensure permitted and unpermitted activities are not degrading or eliminating stream and wetland resources.

Nonpoint Source Pollution Control Program

Nonpoint source pollution is generally agreed to be the largest contributor to water quality problems in the country and in Kentucky today. The Nonpoint Source Section of the DOW was established in 1988 to address these problems. Basically, the Kentucky Nonpoint Source Pollution Control Program consists of programs and projects to implement best management practices (BMPs).

The Kentucky Nonpoint Source Management Program was prepared by the DOW in accordance with the requirements of the Water Quality Act of 1987 and received approval from EPA in November 1989. It describes the control measures, including BMPs, that Kentucky will use to control pollution

resulting from each NPS pollution category (agriculture, construction, etc.) identified in the Kentucky Nonpoint Source Assessment Report, the programs to achieve implementation of those BMPs, and a schedule for implementing those programs.

Because nonpoint source pollution arises from a wide spectrum of diffuse sources throughout the Commonwealth, there are a variety of programs in several agencies that address NPS pollution control. The DOW serves as the lead oversight agency for these programs. Agencies and institutions cooperating in the implementation of Kentucky's NPS Management Program include, but are not limited to, the Kentucky Division of Conservation (DOC), Division of Forestry, Division of Waste Management, Division of Pesticides, Department for Surface Mining Reclamation and Enforcement, Kentucky Conservation Districts, Kentucky Resource Conservation and Development Councils, Kentucky Geological Survey, U.S. National Park Service, U.S. Natural Resources Conservation Service (NRCS), U.S. Agriculture Stabilization and Farm Services Agency (FSA), U.S. Forest Service, U.S. Geological Survey, U.S. Army Corps of Engineers, Tennessee Valley Authority (TVA), University of Kentucky Water Resources Research Institute, University of Kentucky College of Agriculture, Western Kentucky University, The Nature Conservancy, the American Cave and Conservation Association, and the Kentucky Waterways Alliance.

From 1990 through 1995, a total of $7.4 million was received from EPA through Section 319(h) Nonpoint Source Implementation Grants. These projects have included education, technical assistance, watershed projects, demonstration projects, financial assistance, training, and/or enforcement.

Section 319(h) Nonpoint Source Implementation Grant Memoranda of Agreement executed or active during October 1993-October 1995 include:.

14- University of Kentucky
4- Division of Conservation
3-American Cave and Conservation Association
2 - Gateway District Health Department
2 - Kentucky State University
1 - Western Kentucky University
1 - The Nature Conservancy
1 - Kentucky Waterways Alliance
1 - Community Farm Alliance
1 - Kentucky River Area Development District
1 - Barren River Area Development District
1 - Jefferson County Conservation District
1 - Campbell County Conservation District
1 - US Geological Survey

The Kentucky Nonpoint Source Program strives to achieve a balanced approach with the nonpoint source pollution control projects funded under Section 319(h). Optimally, Section 319(h) funded projects should address nonpoint source pollution problems in all major river basins and physiographic regions.

TABLE 5-7. SECTION 404 NATIONWIDE PERMITS (NWP)

NWP Number	WQC Status	Purpose
1	A	Aids to navigation
2	A	Structures in artificial canals
3	A	Maintenance
4	A	Fish & wildlife harvesting, enhancement and attraction devices and activities
5	A	Scientific measurement devices
6	A	Survey activities
7	A	Outfall structures
8	A	Oil and gas structures
9	A	Structures in fleeting and anchorage
10	A	Mooring buoys
11	A	Temporary recreational structures
12	B	Utility line backfill and bedding
13	B	Bank stabilization
14	B	Minor road crossing
15	B	U.S. Coast Guard approved bridges
16	C	Return water from upland contained disposal areas
17	B	Hydropower projects
18	C	Minor discharges
19	A	25 cubic yard dredging
20	A	Oil spill cleanup
21	B	Surface coal mining activities
22	A	Removal of vessels
23	B	Approved categorical exclusions
24	A	State administered Section 404 program
25	A	Structural discharge
26	B	Headwaters and isolated waters
27	B	Wetland and riparian restoration and creation activities
28	A	Modifications of existing marinas
32	A	Completed enforcement actions
33	B	Temporary construction, access and dewatering
34	A	Cranberry production activities
35	A	Maintenance dredging of existing basins
36	A	Boat ramps (no discharge in wetlands)
37	B	Emergency watershed protection and rehabilitation
38	B	Cleanup of hazardous and toxic waste
40	A	Farm buildings

(A) 401 water quality certification not required

(B) 401 general certification denied for activities disturbing >200 linear ft. of stream and/or >1 acre of wetland; individual certification required

C) 401 general certification denied in total; individual certification required

Table 5-8. 401 Certification Activities		
	1994	1995
Section 404 activity	81	79
Nationwide activity	129	178
Certification issued	161	226
Certification waived	4	7
Certification denied	4	2
Certification exempt	41	22

Another type of balance striven for is programmatic balance. Projects that will provide the most effective solutions to local nonpoint source pollution problems are sought for funding. These include education, professional training, technical assistance, enforcement, and watershed demonstration projects.

In addition to geographic and programmatic balance, balance among nonpoint source categories such as agriculture, construction, and resource extraction is also a goal.

Funding priority is given to projects which address nonpoint source (NPS) problems in priority watersheds. Priority watersheds include groundwater, wetlands, rivers, streams, and lakes impacted by NPS pollution. Also, priority watersheds include high quality waters, which because of changing land uses, are threatened by NPS pollution. Priority watersheds impacted by nonpoint source pollution will be published in an updated Kentucky NPS Assessment Report, available from the DOW in early 1997. Based on available water quality monitoring data, the DOW has determined these watersheds to be the most severely impacted in the state. The Kentucky NPS Assessment Report will identify priority nonpoint source watersheds where Kentucky's fishable/swimmable water quality goals are not being met. With limited Section 319(h) Grant funds available for controlling NPS pollution in Kentucky, it is imperative that resources are targeted to priority watersheds, impacted or threatened.

In order to provide accountability for both the state and EPA, those projects selected for Section 319(h) funding must include measures of success. EPA has moved toward accepting a more flexible approach for determining project success. Monitoring of biological and physicochemical parameters in waters is no longer the only acceptable way to determine whether a project is successful.

The most appropriate choice for indicators of project success depends upon the type of project planned. For example, in the case of watershed

projects, the end result should be the attainment of water quality standards. However, for projects dealing with the nonpoint source public awareness programs, measures of success may include surveys of the target audience. Examples of measures of success include:

- Photo or video documentation.
- Demonstrable improvement in relevant chemical, physical, or biological water quality parameters.
- Number of plans implemented for erosion and sediment control, storm water, nutrient management, pest management, etc.
- Number of best management practices (BMPs) implemented in watersheds of impaired or threatened waters.
- Percentage of needed BMPs implemented in watersheds of impaired or threatened waters.
- A statistically based survey of BMP implementation rates, based on periodic compliance surveys.
- A statistically based survey of public awareness, knowledge, and actions to measure changes in attitudes and behavior over time.

Monitoring

Nonpoint source pollution problems in the waters of the Commonwealth originate from land-based activities. The direct interrelationship between land activities and water quality necessitates that both land and the aquatic environments be monitored and evaluated. To this end, the NPS Pollution Control Program includes two aquatic biologists who are responsible for the collection, assessment, evaluation, and interpretation of water quality and corresponding land-based data.

Physical characteristics, water chemistry, aquatic biological community structure, and land-based activities are different aspects of the waterbody's ecosystem that may be monitored. A multifaceted approach is necessary for NPS monitoring because of the mobility of NPS pollutants, the varying degrees of pollutant toxicity, the close interrelationship of land-based activities and NPS pollution, and the spatial and temporal variabilities of ecosystems. Nonpoint source standard operating procedures provide instruction and guidance in, and ensure standardization of, study plan development, station location selection, and monitoring of water quality, land use, land treatment, and weather. The standard operating procedures manual for nonpoint source water quality monitoring projects is available from the NPS Pollution Control Program.

Water Quality monitoring is an important aspect of the NPS program, especially if monitored water Quality data are lacking, existing NPS pollution problems need to be quantified, or documentation is needed to show changes in water quality where alterations in land-use practices have occurred. Monitoring is an important component of NPS

watershed pollution remediation demonstration projects.

Demonstration Projects

Mammoth Cave. Public awareness and concern over water quality problems affecting Mammoth Cave National Park resulted in the development of the Mammoth Cave Karst Area Water Quality Oversight Committee. Its purpose is to achieve coordination among citizens, land users, and government agencies in monitoring and improving water quality in this karst drainage area.

A multi-agency technical committee consisting of representatives from local and state NRCS offices, FSA, U.S. National Park Service, DOC, DOW, Kentucky Geological Survey, U.S. Geological Survey, TVA, University of Kentucky College of Agriculture, Western Kentucky University Department of Agriculture, and Western Kentucky University Center for Cave and Karst Studies was established to work with the Mammoth Cave Karst Area Water Quality Oversight Committee to develop a nonpoint source watershed pollution remediation project for the Mammoth Cave area. The DOW's role in the watershed project is focused on evaluating BMP effectiveness on select demonstration farms.

Local NRCS and FSA representatives prioritized farms in the Mammoth Cave project area as potential agricultural demonstration sites. Based on land resource needs, accessible water monitoring areas, and farmer cooperation, five farms were chosen as demonstration sites. The farms are being used to educate farmers in the project area about the use of BMPs for controlling nonpoint source pollution. BMPs have been implemented in a holistic systems approach at two farms, and animal waste treatment facilities are planned or have been installed at three other farms.

Multi-agency monitoring efforts are being used to document agricultural impacts on the quality of surface water, groundwater, and wetlands and to address cross-media interactions. The DOW has developed monitoring study plans for each of the demonstration farms, has coordinated monitoring activities with other involved agencies, is monitoring water quality, and will interpret and document changes in water quality that relate to BMP implementation.

Upper Salt River/Taylorsville Lake Watershed. Taylorsville Lake is highly eutrophic and has experienced problems with low dissolved oxygen concentrations, algal blooms, suppressed fish production, and occasional fish kills. The reason for these problems is the elevated nutrient levels in the streams feeding the reservoir. In an effort to alleviate these problems, the NRCS, Kentucky DOC, COE, and the DOW have undertaken studies and projects to determine the nutrient concentrations in the reservoir and streams feeding the reservoir, specific sources of these nutrients, the amount of nutrient reduction needed to improve reservoir water quality, and methods to achieve the needed reductions. The U.S. Geological

Survey is also assisting with high-flow water sample collection through a cooperative agreement with DOW.

Agricultural best management practice (BMP) cost-share funds have been made available to remediate nonpoint source pollution in the watershed as part of a U.S. Department of Agriculture (USDA) five-year Hydrologic Unit Area Water Quality (HUAWQ) project. The goal of the HUAWQ project is to abate or prevent water quality degradation in both surface and groundwater in the watershed. To achieve this goal, the identified sources of contamination are being addressed by the use of best management practices. For FFY91 through FFY93, the HUAWQ project received a total of approximately $850,000. In addition, $55,000 cost-share funds were awarded in FFY92 as part of a Water Quality Incentive Program for implementing non-construction, management-type BMPs.

One of the first nonpoint source monitoring initiatives in the watershed was an intensive bacteriological investigation. The bacteriological data were used to: (1) assess point source compliance, (2) determine support or nonsupport of primary contact recreation, and (3) target animal waste BMPs in the watershed. Another bacteriological investigation in 1994 determined that animal waste management practices have reduced bacterial contamination in the watershed.

High phosphorus concentrations in the Salt River found by the pre-BMP sampling were attributed primarily to nonpoint source runoff from the fertile soils of the Inner Bluegrass physiographic region. The U.S. Army Corps of Engineers (COE) is presently modeling the response of the water quality of Taylorsville Lake to various watershed management techniques by means of the CE-QUAL-W2 model and available water quality data. Modeling results will be used to identify BMPs in the watershed that will most effectively reduce nutrients from nonpoint sources. More than $1 million has already been spent to implement BMPs to treat wastewater from concentrated animal management areas on dairy farms. These BMPs have not only reduced known bacteria contamination problems, they also were a first step in reducing nutrient input to streams in the watershed. Post-BMP monitoring of streams in the watershed and in Taylorsville Lake will determine the effectiveness of the program.

Big South Fork/Bear Creek Interstate Watershed. The Big South Fork/Bear Creek demonstration project is located in an interstate watershed that lies in both Tennessee and Kentucky. Bear Creek flows north from Tennessee into Kentucky, where it joins with the Big South Fork of the Cumberland River. A large portion of the Big South Fork watershed is classified and operated as a National River and Recreation Area by the National Park Service. Nonpoint source pollution impacts to Bear Creek begin outside the Big South Fork National River and Recreation Area (BSFNRRA) in Tennessee. The lower portion of Bear Creek lies in Kentucky, mostly within the BSFNRRA.

The Bear Creek drainage is primarily affected by unreclaimed strip mines. The abandoned coal mine sites are characterized by heavily eroding spoil banks and acid mine drainage. Minimal reclamation efforts were implemented after mining, and consequently, severe water quality problems exist because of abandoned mine land runoff. The biological communities within Bear Creek are severely impacted by acid mine drainage, and the creek does not support the aquatic life use. Values for pH ranged from 4.3 to 8.2 SU, with an average value near 5.6 SU. These low pH values also affect contact recreational uses.

The goal of this project is to improve water quality by reducing acid mine runoff, improving stream and bank habitat, and improving citizen understanding of the project. To meet this goal, the Tennessee Nonpoint Source Program, in cooperation with the Tennessee Land Reclamation Program, developed a rehabilitation plan for the Bear Creek watershed that calls for the implementation of BMPs and water quality monitoring. The BMPs, including drainage control structures, subsurface limestone drains (anoxic alkaline trenches), aeration, and artificial wetlands, are expected to be installed by the end of 1997.

To document changes in water quality associated with BMP implementation, the Tennessee Nonpoint Source Monitoring Team is monitoring water quality in the Tennessee portion of Bear Creek before and after BMP implementation. The Kentucky Nonpoint Source Monitoring Team is supplementing Tennessee's activities by monitoring water quality at a station at the mouth of Bear Creek in Kentucky. To address possible temporal variability in water quality of Bear Creek, Rock Creek, a Kentucky Outstanding Resource Water, has been selected as an appropriate reference stream. An automatic water sampler was installed at the Bear Creek station to collect rain-event water samples for analysis. Quarterly biological monitoring is being conducted at both the impacted and reference stations in order to document recovery of the stream biota. To ensure that biological data from Tennessee and Kentucky are comparable, Tennessee Standard Operating Procedures are being used by Kentucky for this project.

Fleming Creek. Fleming Creek, a tributary of the Licking River, is 39 miles long and drains an area of 61,670 acres. The mainstem and tributaries are contained almost entirely within Fleming County in northeastern Kentucky. Fleming County ranks third statewide in number of dairy cattle. Eighty-five feedlot operations occur in this watershed. Moreover, an estimated 1.7 million cubic feet of animal waste is washed into local streams annually, resulting in water quality degradation.

A USDA BMP cost-share project for the Fleming Creek watershed was funded in 1992. The DOW and USDA are cooperating agencies in this project area. DOW has the responsibility of monitoring the effectiveness of the pollution remediation activities in the watershed.

The water quality monitoring for this project is being conducted in three distinct phases. The first phase consisted of a bacteria and nutrient survey throughout the watershed during both high- and low-flow conditions in the spring and summer of 1992. The main purpose of this phase was to examine the entire watershed with respect to point and nonpoint pollution sources to target those areas most affected by animal wastes. It is envisioned that this survey will be repeated once all BMPs are installed to determine if water quality improvements occurred as a result of BMP implementation.

The second phase consists of long-term monitoring at select stations to measure water quality changes in the watershed over time resulting from BMP installation. Nutrient water quality data are the focus of this monitoring phase. Based on phase one monitoring, five long-term water quality monitoring sites were selected. Although some data from low-flow conditions will be collected during this phase, most monitoring will be associated with storm events.

The third phase consists of biological and physicochemical data collection at two of the more impacted tributaries within the watershed as well as a station located on Fleming Creek downstream of all proposed BMPs. This phase will supplement phase two physicochemical data collection. Biological communities will be biometrically compared over time to evaluate and document changes in community structure that reflect improvements in water quality.

Pre-BMP water quality data indicate that Fleming Creek has been impacted from animal waste. The bacteriological survey indicates that the entire watershed is affected. Stations were established on Fleming Creek and at the mouth of every major tributary within the watershed. Fecal coliform levels ranged from 500 colonies per 100 ML to more than 15,000 colonies per 100 ML at the tributary stations for the high-flow event. Total phosphorus and nitrogen levels (TKN and NO_2 - NO) have been detected at elevated levels (1-3 mg/l), particularly at the tributary stations. Based upon algal data, eutrophic to hyper-eutrophic conditions occur at certain locations within the watershed. In addition, there is an unusually high number of tolerant macroinvertebrate species at Allison Creek station. However, a preliminary evaluation of biological communities in Fleming Creek does not indicate impairment.

319(h) Implementation Grant Projects

Horse Lick Creek. Horse Lick Creek lies within a 62-square mile watershed in Jackson and Rockcastle counties in the Upper Cumberland River Basin. It was designated as one of the "Last Great Places" by the Nature Conservancy in 1992. About 15,000 of the 40,000 acres are within the Daniel Boone National Forest, and the Nature Conservancy owns 1,700 acres. The creek is home to a unique aquatic community. Almost a quarter of Kentucky's mussel species and more than 30 species of fish are found there. Of the 72 mussel species that historically inhabited the upper Cumberland River basin in Kentucky, 36

are extinct, and 11 of the remaining species are rare at the state or federal level. Also, the watershed harbors a number of other endangered species, especially bats and cave invertebrates. These characteristics make Horse Lick Creek one the premier sites for the protection of biological diversity on the western slope of the Appalachians.

The Nature Conservancy has entered into MOUs with the U.S. Forest Service, the Kentucky Department of Fish and Wildlife Resources, and the Kentucky Nature Preserves Commission to protect and improve the Horse Lick Creek watershed.

The Kentucky Chapter of the Nature Conservancy is gathering physicochemical and biological data designed to target water quality problems within the Horse Lick Creek watershed. Monitoring commenced before and continues during and after the installation of BMPs in an effort to document water quality improvements. Water quality monitoring began in May 1994 and will continue for three years.

Triplett Creek. Triplett Creek in Rowan County is impacted by nonexistent and failing onsite (home) wastewater treatment systems, causing unacceptable levels of pathogens and nutrients. The purposes of this project are to:

1) establish baseline water quality in the watershed;
2) identify specific residential areas contributing sewage-related contaminants;
3) develop compliance options for failing or nonexistent onsite wastewater systems;
4) install preferred options, with cost-share support if necessary; and
5) document post-BMP water quality changes.

Nutrient and Pesticide from Turfgrass Management Areas. The primary purpose of this project is to evaluate the impact of several chemicals (nitrate, phosphate, 2,4-D, chlorpyrifos, diazine, chlorothalonil, and metalyaxyl) used in lawn care and golf course turfgrass management in areas of karst topography. These data will be used to produce a Turfgrass Industry BMP manual for Kentucky. The golf course provided daily chemical application data. Therefore, water samples were analyzed for pesticides in response to treatment on the golf course.

Lawn treatment companies were contacted and asked to cooperate by providing application schedules. Pesticides were analyzed in response to application.

Samples were collected every Monday between April 1 and November 30, 1994. If a significant precipitation event occurred, samples were collected every four hours to attempt to quantify the storm event impact on pollutant transport. Samples were collected from all three sites.

Elkhorn Creek. Portions of the Elkhorn Creek watershed are impaired due to sediment, nutrient, and pathogen loading from nonpoint and point sources.

Livestock production is important in the watershed and potentially contributes a large part of the nonpoint pollutant loading. The stream is a valuable recreational resource to the area and has provided an emergency source of drinking water during prolonged summer droughts. However, primary contact recreation and warmwater aquatic habitat uses are being adversely affected and, in much of the watershed, are not being supported. Direct access of livestock to streams within the watershed is contributing to degradation of the streams. This degradation affects water quality, wildlife habitat, and recreation activities. Moreover, riparian vegetation provides the major continuous wooded area and crucial wildlife habitat within the watershed.

Often, traditional methods of excluding livestock from streams and providing livestock water supply are not cost effective or practical. Fortunately, promising fencing systems and water supply alternatives are available. This project is demonstrating to farmers the following four alternatives:

1) ram pump
2) pasture pump
3) solar powered water pump
4) limited access watering points, using new fencing components (solid state automatic water-sensing electric fencing switches)

These systems have the potential to protect stream quality while providing a cleaner and safer water supply for livestock. To facilitate the acceptance of new BMPs, demonstration farms are needed. In addition, documentation of changes in water quality and habitat resulting from the use of BMPs is required.

The purpose of the monitoring is to document effectiveness of selected BMPs in reducing nonpoint source impacts on water quality and to document or demonstrate changes in water quality for the Elkhorn Creek basin.

Each of four nontraditional BMPs, which provide alternatives to unlimited stream watering and access by farm livestock, are being implemented on selected demonstration farm sites. Monitoring program elements include water chemistry, habitat, and biological. Monitoring is being conducted at each of the demonstration farm sites and includes upstream and downstream stations at each site. Two years of post-BMP water quality data will be collected. Habitat assessment will be conducted for four years in order to adequately document changes in habitat.

Pleasant Grove Spring Karst Basin. A three-phase effort is ongoing to test the effectiveness of a Best Management Plan (BMP) program to manage the impact of agricultural production on ground-water quality in a karst drainage basin. For this reason, a karst basin large enough to include a variety of agricultural practices was chosen, as opposed to an individual farm or field.

Pleasant Grove Spring drainage basin is a mature karst aquifer encompassing approximately 10,291

acres (16.1 square miles) which underlies an intensively farmed area in Logan County. A general land-use inventory showed that 92 percent of the watershed is in some type of agricultural production. Except for rural housing, no other activities which might result in ground-water contamination, such as industry or petroleum production, occur in the basin. No single BMP is expected to have a measurable improvement on ground-water quality at this scale. Rather, the impact of the program as a whole, including public education regarding ground-water contamination, will be monitored.

Phase I, initial reconnaissance and mapping, and Phase II, data collection for quantifying the contaminant load from the watershed under current land use and BMP conditions, have been completed.

Phase III is quantifying contaminant loads discharging from the spring during and after BMP installation to gage the effectiveness of the program. The annual flux of triazine, nitrate, and sediment will be calculated from sample concentrations and a continuous discharge hydrography for the spring. Four upstream sites monitored during Phase II are also being monitored in Phase III.

Funding has been obtained through the USDA Water Quality Incentive Program to aid farmers adopting farm management practices that protect ground water. Funds granted for this work total $251,000 over a three-year period. Most of the money will be used during the first year. The funding was sought by the Bowling Green office of the Natural Resources Conservation Service under a proposal titled "Pleasant Grove Spring, Water Quality Incentive Project (WQIP) Application." The plans that farmers will have available to them are listed in the proposal and include brush management, conservation cover, conservation cropping sequence, conservation tillage, contour farming, cover crops, critical area planting crop residue use, deferred grazing, filter strips, grasses and legumes in rotation, integrated crop management, livestock exclusion, mulching, pasture and hayland management, pasture and hayland planting, planned grazing system, record keeping waste management systems, waste utilization. More than 40 farms are at least partly within the watershed. It is not known at this time which BMP, or how many of each, will be applied to each farm. The budget in the WQIP Proposal details the relative emphasis each BMP will receive. However, the plans that focus on the prevention of sediment loss, reduction of runoff from crop fields, nutrient management, reductions in pesticide use, and animal waste management will be strongly encouraged by KGS. However, it should be noted that if the implementation of the BMPs fails to improve ground-water quality, then the need to restructure USDA protection programs will be strongly indicated.

Data Collection/Data Management

A necessary and important function of the nonpoint source program is the collection and management of NPS-related information. The cooperative, multi-agency nature of the program

prescribes the reliance upon, and utilization of, existing data such as land-use classification statistics, baseline water quality values, and best management practice evaluations. To this end, an NPS document library has been developed. All NPS-related documents are catalogued, and pertinent data are entered on computer for future retrieval. In addition, a computer literature search service has been identified and utilized for accessing other scientific and technical information pertinent to the program. Several statewide databases have been identified and utilized, including county-specific fertilizer and pesticide databases.

Education

To a large extent, the implementation of BMPs to control NPS pollution relies upon voluntary adoption of BMPs by those who manage the use of Kentucky's land resources. Therefore, education plays a vital role in Kentucky's NPS Management Program. NPS education programs inform land users and other Kentucky citizens about the causes, consequences, and solutions (BMPs) for the various types and sources of NPS pollution.

The DOW nonpoint source program supports and coordinates with a wide spectrum of NPS education activities and programs conducted by a number of agencies and institutions. The DOW has provided program speakers for school classrooms, field days, environmental fairs, civic groups, trade organizations, and professional meetings. Additionally, exhibits and other educational materials have been provided for use in conferences, fairs, field days, and clean-up days.

Several NPS education projects supported by 319 funds have been or are currently being conducted under the oversight of the DOW NPS program:

- The slide/video program and accompanying brochure, "Every Time It Rains," a general introduction to NPS pollution problems in Kentucky targeted to the general public, was produced by the Center for Math, Science, and Environmental Education at Western Kentucky University (WKU).

- WKU has also produced a video program on abandoned minelands and water quality targeted to general audiences in Kentucky and Tennessee. It centers on the Bear Creek/Big South Fork demonstration project as an example of how these problems can be solved.

- The Kentucky Division of Forestry developed a forestry NPS video, slide/tape show, brochure, and best management practices manual to promote the use of forestry best management practices.

- The Gateway Region Environment-Education Network (GRE-EN), based in the Gateway District Health Department, conducted a multi-faceted education program in the five-county Gateway Region that targeted agriculture, septic systems, and illegal dumps.

- The Warren County Conservation District has been conducting a number of educational activities that present NPS pollution problems and solutions arising from construction and urban runoff in karst regions, including contractor field days and the construction of a high-quality portable exhibit.

- The American Cave Conservation Association (ACCA) built an exhibit in its American Museum of Caves and Karstlands, located in Horse Cave, which illustrates the many types of human activity that can pollute groundwater. ACCA is currently implementing a statewide karst education program that includes a school curriculum, a series of newspapers for classrooms, and teacher training workshops.

- The Groundwater Education and Rural Well Water Testing Program conducted public educational meetings in most of Kentucky's 120 counties concerning groundwater quality. Private well water analysis and technical assistance to remedy problems revealed by the testing were made available to program participants.

- The University of Kentucky Cooperative Extension Service has adapted the national Farmstead Assessment System (Farm*A*Syst) program to produce the Kentucky Assessment System (KY *A* Syst). The program includes sets of informational flyers and assessment worksheets. A pilot program is being conducted in several Kentucky counties. KY*A*Syst is a comprehensive farm site assessment that helps rural residents and farmers assess the impact of their farmstead structures, soil geology, and management practices on groundwater quality.

The Water Watch program (described in Chapter 1 of this report) has proven to be a particularly valuable channel for educating citizens about NPS water quality problems and solutions. The Water Watch and NPS program staff have further expanded Water Watch educational materials and programs to include more information on BMPs and NPS pollution control. Water Watch trains citizen volunteers to identify land-use activities that are contributing to NPS pollution of their adopted waterbody and collect data about water quality, aquatic life, and aquatic habitat conditions, including supplemental monitoring for NPS demonstration projects. Specifically, the Water Watch Nonpoint Source Local Education Initiative, funded under Section 319, conducted training workshops for selected Water Watch groups and produced accompanying sets of specific localized publications and slide/video programs. It also conducted a program for high school students to study the impact of spring rainstorms on stream water quality that utilizes immunoassay screening for pesticides.

Future Direction

The DOW is in the process of updating its program milestones and the original Kentucky Nonpoint Source

Management Program document. Nonpoint Source programs and issues that are being addressed in the update are based on input gathered during an interdisciplinary meeting held in March 1995 and formal public comment.

Also, in an effort to more effectively support state nonpoint source (NPS) programs, EPA is significantly restructuring its nonpoint source grant program and revising its process for evaluating state grant requests. EPA is recognizing that what is an effective nonpoint source program in one state may not be effective in another.

However, while Kentucky will have more flexibility in choosing the most effective nonpoint source programs for the Commonwealth, it will also be held more accountable for making progress in achieving and maintaining beneficial uses of water. To ensure that Kentucky is striving to achieve this vision, EPA has outlined the following eight key elements for evaluating nonpoint source management programs:

- Explicit short- and long-term goals for protecting surface water and groundwater.
- Emphasis on preventing degradation from both present sources and future activities.
- Identification of those waters significantly damaged by nonpoint source pollution.
- Flexible, targeted, and iterative approaches to maintaining water quality standards.
- Sound financial management.
- Strong partnerships with appropriate stakeholders.
- Identification of federal lands and management objectives that are not consistent with state program objectives.
- A self-evaluation procedure for states to assess and improve their programs.

Section 319(h) funded projects are noticeably absent in the far eastern and western portions of the state. In order to achieve better geographic balance, focused nonpoint source pollution control initiatives in these areas are needed. For better programmatic balance, more statewide initiatives that address nonpoint source pollution control through both education and professional training are needed. In addition to statewide programs, Kentucky needs specific watershed projects that address preventing nonpoint source pollution from both current and future sources.